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(54) WEFT INFEED AND TRANSFER APPARATUS

(71) We, SOCIETE ET.CO.MA., of 25 rue Poincare, Capinghem 5 9160 Lomme, France, a French Body Corporate, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described, in and by the following statement:—

The invention relates to a weft infeed and transfer apparatus for shuttleless looms.

The grip of the infeed rapier of transfer apparatus must be sufficiently weak to ensure that weft thread will not break when being introduced under the rapier and the grip of the infeed rapier must be strong enough to pull the weft without releasing it. Further, the grip of the transfer rapier of the apparatus must be lower than that of the infeed rapier so as to ensure that transfer of the weft from one rapier to the other can take place, although this grip must be sufficiently strong to pull the weft thread without releasing it. The resistance to pulling of the weft thread increases with the length of the thread to be pulled, and is greater when the thread is being pulled by the transfer-rapier than when it is being pulled by the infeed rapier.

Hence, the gripping forces applied have to be controlled so as to enable the following requirements to be reconciled; the gripping force has to be weak enough to ensure that the weft thread will not break, and the grip exerted by the rapiers has to be great enough to ensure that the weft will not be released while being carried through the loom shed.

An object of the present invention is the provision of a weft transfer apparatus equipped with infeed and transfer rapiers, in which adjustment and control difficulties are eliminated and in which there is a greater safety margin in operation.

According to the invention there is provided weft infeed and transfer apparatus, comprising an infeed rapier having a gripper system for gripping weft thread and constituted by a body portion in the form of generally U-shaped element, and a substan-

tially channel shaped cover portion pivotally mounted to the body portion so as to form a tubular assembly and gripper assembly, and a transfer or receiving rapier which is constituted by a stationary element and a movable element which is pivotally connected to said stationary element said transfer rapier having self-gripping effect members for the weft thread received from the infeed rapier.

The invention may incorporate one or more of the following features:

a) In the tubular rapier the pivot pin extends the whole width of the cover so as to present a maximum length, with a view to preventing wear.

b) In the tubular rapier a front abutment of the rapier is constituted by a bent-over part of the cover or top, movement of this abutment being limited by a stop carried by the body.

c) In the tubular rapier closure of the gripper members is effected by a spring, and a set screw lying close to the boss—by means of which the rocking action is effected—assumes a position of abutment against the said body and controls the possible extent of opening.

d) In the self-gripping rapier the movable element is in the form of a lever one of those ends carries a constituent part of the gripper system associated with a lug which holds back the weft thread and acts in conjunction with a ramp carried by the stationary hook.

e) In the self-gripping rapier the movable element is constituted by a pivotable rod one end of which carries a constituent part of the gripper system whose orientation with respect to the pivotable rod is realised in combination with the gripper part of the hook unit.

f) In the two rapiers the gripper member is removable and is fixed on the movable element, the position of this gripper member relative to the movable element being controllable by means of screws and oblong holes.

It will be understood that the infeed rapier

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enables the rapier to open at the instant at which the weft thread is to be gripped. As the pressure is zero at the instant at which the weft thread is inserted under the rapier there is no risk of the weft thread breaking. On the other hand during the passage of the weft through the loom shed, the pressure must be sufficiently great to prevent the weft from being released. The tubular shape selected results in economic manufacture, more reliable operation, and easy and simple adjustment and control.

Further, the self-gripping transfer or receiving rapier is acted on by a relatively weak spring, and this enables smooth and easy transfer of the weft thread whatever the pressure of the infeed rapier. On the other hand, during the passage of the weft thread through the shed, the friction of the weft thread being carried through the shed causes a pulling effect to be applied to the end of the gripped weft and this, by virtue of the provision of a novel device, appreciably increases, by a self-gripping effect, the gripping force applied by the spring.

Furthermore, at the instant at which the weft is released at the end of its passage through the shed, the force which has to be applied for opening the rapier only has to take into account the force of the spring, so that this force required for opening the rapier is less than is true in the case of the known forms of construction. Accordingly, for the same work performed, the rapier may open more rapidly and there will be a greater regularity in the length of the weft end projecting from the cloth, whereby wastage of weft thread can be reduced.

The transfer or receiving rapier incorporates a stationary hook one surface of which constitutes one of the gripper elements, and a movable part which carries the other constituent element of the gripper system, in combination with a self-gripping device, which can be realised in two different ways: viz. by a rockable lever which carries, in addition to the gripper element, a lug acting in conjunction with a ramp carried by the stationary part and supporting the hook, or by a pivotable rod which carries the gripper element whose orientation is combined with that of the hook.

In order to further explain the invention several embodiments thereof are described below, by way of example only, with reference to the drawings, in which:

Figure 1 is a perspective schematic view of an infeed rapier according to the invention, parts being omitted for clarity;

Figure 2 is a cross-sectional view taken along line II—II of Figure 1, on a different scale;

Figure 3 is a partial side view of the infeed rapier, on the same scale;

Figure 4 is a schematic perspective view of a self-gripping transfer rapier;

Figure 5 is a similar view, on a larger scale, of the end of the rapier, which end has been turned round in order to better show the route taken by the thread;

Figure 6 is a schematic perspective view of another embodiment of a self-gripping transfer rapier;

Figure 7 is a partial view, similar to that of Figure 6, in which the pivotable rod of the rapier, together with its levers, are viewed from the other side, and

Figure 8 is a schematic side view of a hook unit or assembly, forming part of the rapier, this view showing, in particular, one of the bearings of the pivotable rod.

A tubular infeed rapier of weft transfer apparatus comprises a body 1, preferably of some light material and having the general shape of an angle iron, and also a generally channel shaped rockable steel cover or top 2. A pivot pin 4 is mounted in a bearing 3 on the body 1, the cover or top 2 being adapted to rock about this pin 4.

The body 1 also comprises conventional bosses 5 and 6 for enabling the rapier to penetrate into a loom shed (not shown). Body 1 further comprises base members 7 and 8, made of treated steel. These base members are fixed by screws 7a and 8a in such a way that they can easily be removed and replaced when worn.

The rockable cover 2 has a protective tip 9. Gripper or rapier elements 10 and 11, made of treated steel, are secured to cover 2 by screws 10a and 11a, so that they are replaceable when worn. The gripper or rapier element 10 can easily be adjusted, when being assembled on the rockable cover, by means of screws 10a (Figure 2). These screws cooperate with a receiving screw-thread in the rapier element 10, and the corresponding hole in the cover is oblong, so that the heightwise position of the gripper element with respect to the base member can be adjusted, thereby enabling the rapier member to be brought to bear with exactly the right pressure against the base member. Figure 3 shows with particular clarity the position of the screw heads 10a in the oblong holes of the rockable cover, these screws being screwed into the rapier. Provision of rapier member 11 is optional, although it is preferable to provide it. It is at the same time a rapier and a spring whose force is appreciably less than that exerted on the rockable cover by the main spring of the weft transfer apparatus. This rapier member serves the purpose, when required, of holding a weft thread slightly stretched in the infeed section of the weft transfer apparatus, so as to facilitate transfer of this weft thread when it has to be passed over to

a transfer or receiving rapier of the weft transfer apparatus.

5 A spring 12 is fixed onto the body 1 by means of screws 12a. The free end of this spring 12 bears under the rear end of the rockable cover 2, so that the front end of the rockable cover is urged downwardly towards the front end of the body of the rapier, whereby the rapier of gripper elements 10 and 11 are closed on to their associated base members. It is possible, to fix the spring 12, by screws 12a, at any other point of the body 1, and to arrange for the free end of the spring 12 to bear against the rockable cover at any other suitable point thereof, for example on the rapier element 10. Some simple device for altering the pressure of this spring 12 could be provided.

20 A protuberance or boss 13 attached to the cover 2. When this protuberance comes into contact with a cam 14, located in the path of movement of the weft transfer apparatus and fixed on the lay on which the weft transfer apparatus travels, the cover 12 rocks and opens the rapier elements at the instant at which the weft thread is to be gripped by the rapier.

30 The extent of rocking movement of the cover is limited at two points. The first of these two points is constituted by a set screw 15 which cooperates with a nut 16 fixed to the cover. The head 15 of this screw comes into abutment with the body 1. The second of these points is a stop 17. This stop is constituted by a bent-over portion of the cover 2, the upward movement of this bent-over portion being terminated by a small part 18 fixed on the body 1, for example by means of one of the securing screws 7a of the base (sole) member 7. It is important to thus limit the extent of lifting movement of the cover because, if the latter were to open to too great an extent, the warp threads could be damaged.

45 This infeed rapier affords important advantages. Firstly, owing to the fact that it is made in two parts, it can be much more economically manufactured than an infeed rapier comprising a machined tubular block. Further, it is possible to fit simple (and thus economic) rapier elements on this type of infeed rapier. These rapier or gripper elements are accessible and can thus be easily adjusted. If they become worn they can be straightened or trued-up.

60 It is to be noted that the general shape of a rockable cover enables the use of a pivot pin which extends over the whole width of the weft transfer apparatus, thereby eliminating too rapid wear and too great play. As has been noted above, the provision of two stop members prevents the rapier opening to an excessive degree.

65 The self-gripping transfer or receiving

rapier, which cooperates with the tubular infeed rapier, is illustrated in Figures 4 and 5.

70 As is apparent from these figures, this rapier is mainly constituted by two elements, viz. a fixed section 101 and a rockable lever 102, whose swivel pin is designated as 103. A hook unit 104 is screwed to the stationary section 101. The stationary section 101 is itself fixed to a support 105, structurally integral with a weft transfer strap or band 105a. Fixed to one end of the rockable lever 102 are a retaining or catch member 107, a rapier element 108, a lug 109 and, at the other end, a roller 110.

80 Arranged on the support 105 and integral with the stationary section 101 is a support 111 for the roller 110. When a tongue 112 is introduced between the roller 110 and the support 111 therefor, the lever 102 is rocked about its fulcrum.

85 A spring 113, which is supported against the stationary section 101 or against the support 105, continuously acts against the rockable lever 102, so that the gripper element 108 is caused to bear against the hook unit 104.

This rapier operates in the following manner:

95 A weft thread 114, which has been placed perpendicularly of the path of travel of the rapier, takes up a position between the hook 104a and the gripper element 108. This weft thread 114 comes into abutment against the retaining element 107 and the base of the lug 109b, then moves up the ramp 101a and becomes lodged in the notch 101b. The retaining element 107 cooperates with the base of the lug 109b to prevent the weft thread 114 from passing by the gripping zone between 104a and 108.

100 The pull of the thread then brings about a self-gripping effect. The braking force A of the thread in the gripping assembly 104a—108, combined with the pulling force B upwardly directly by the ramp 101a, gives a resultant force R which is upwardly applied onto the lug 109, this resultant force R combining with the pressure exerted by the spring 113. The greater the force B the greater will be the resultant force R, and, in turn, the greater will be the braking force A, so that a self-gripping action of the rapier is achieved.

105 When it is desired to free the weft thread 114, the gripper system 104a—108 is opened by inserting the tongue 112 between the roller 110 and the supporting surface 111 for the roller 110.

110 A force A is no longer effective, and the free weft thread section is no longer held back. Moreover, the inclined portion of the lug 109a causes the weft thread to be upwardly urged, which results in rapid freeing of the weft thread.

The mode of assembly of the elements 107, 108, 109 on the rockable lever 102—and the manner in which the hook assembly 108 is fixed to the stationary section 101—
 5 enables easy and cheap replacement of these elements when they become worn and permits the use of simple, small parts made of carbide. The holes of the gripper element 108 are greater than the diameter of the securing screws, so that correct juxtaposition
 10 of the surfaces of the gripper component 104a and 108 can be simply effected.

Figures 6, 7 and 8 illustrate another embodiment of the self-gripping transfer rapier.
 15 This rapier is essentially composed of a stationary section 201 and of a pivotable rod 202.

A hook unit 203a is fixed on the stationary section 201 by means of screws 204. This
 20 hook unit has a flat surface 203 which forms a gripper element, and also a recess 203c (Figure 8) which forms a bearing for the pivotable rod. The other end of the stationary section 201 is structurally integral with
 25 the support 205, which is itself fast with the drive strap or band 205a, provided for driving the weft transfer apparatus.

The pivotable rod 202 carries a tongue 206 which constitutes the other element of
 30 the gripper assembly, and a lug 207. The unit is fixed in place by screws 208. Each end of the pivotable rod 202 is formed with a journal and it abuts against a ball 209 at one end. A bearing 203c is arranged in the
 35 hook unit. The other bearing 211 is adjustable in the stationary section at 201a.

Coiled round the rod 202 is a torsion spring 211, one end of which is attached to
 40 a stationary section at 201b and the other end of which is attached to a ring 212, which can be turned to another desired position of rotation, and then locked in this position,
 45 on the rod 202, by a clamping screw 213. By thus turning the ring 212 about the rod 202 the pressure of the weft-gripping system can be adjusted as required. Also extending round the rod 202 is a lever 214,
 50 which is attached to the rod 202 and bears a roller 215.

Attached to the stationary section is a bearing 201c, in which is mounted a lever
 55 216, one of whose ends terminates in a flat horizontal part 216a, which engages under the roller 215. The lever 216 also carries a roller 217 which is caused to bear against the support 201d (for the roller 217) by means of a spring 218.

This rapier functions in the following manner:

60 The torsion spring 211 causes the tongue 206 to bear against the face 203a of the hook unit. In order to reliably control the manner in which tongue 206 thus bears against the face 203a of the hook unit, a clearance
 65 is left between the roller 215 and the flat

horizontal part 216a of the lever 216, the flat part 216a being retained in its lowered position due to the fact that roller 216 bears against the support 201d subject to the force of spring 218.

A weft thread 219 placed transversely of the path of travel of the weft transfer apparatus is introduced under the hook 203 in the gripper system 203a—206. The pulling force A exerted on the weft thread causes
 70 the tongue 206 to be wedged on the face 203a, this wedging effect increasing in strength with increasing force A. Thus, there is a self-gripping effect. Lug 207 cooperates with the point at which the weft thread bears to prevent the weft thread 219 from passing by the gripping area 203a—
 75 206.

A tongue or bar 220, suitably positioned in the path of travel of the weft transfer apparatus, lifts the roller 217 at the desired
 80 moment, so that the lever 216 and roller 215 are lifted in turn, the result of which is that the rod 202 is pivoted and tongue 206 releases the weft thread 219.

The tongue 206 has securing holes whose diameter is greater than that of the clamping screws 208, which enables the tongue 206 to be straightened, so that the correct relative positioning of the parts of the gripper
 85 system is thus facilitated. Finally, the provision whereby the hook unit is secured by screws 204, and whereby the tongue 206 and lug 207 are secured by screws 208, enables small components, made of tungsten carbide
 90 to be replaced.

WHAT WE CLAIM IS:—

1. Weft infeed and transfer apparatus, comprising an infeed rapier having a gripper
 95 system for gripping weft threads constituted by a body portion in the form of a generally U-shaped element, and a substantially channel shaped cover portion pivotally mounted to the body portion so as to
 100 form a tubular assembly and gripper assembly, and a transfer or receiving rapier which is constituted by a stationary element and a movable element which is pivotally connected to said stationary element said
 105 transfer rapier having self-gripping members for the weft thread received from the infeed rapier.

2. Weft infeed and transfer apparatus according to claim 1, characterised in that
 120 the cover portion is pivotally mounted to the body portion by means of a swivel pin which extends the whole width of said cover portion, this maximum length of the swivel pin serving to prevent wear thereof.

3. Weft infeed and transfer apparatus according to either one of claims 1 to 2,
 125 characterised in that the tubular infeed rapier is provided with a forward abutment, which lies close to the gripper system located 130

at one end of the infeed rapier and is constituted by a bent-over portion of said cover portion, the movement of said abutment being restricted by a stop member carried by the body portion of said infeed rapier.

5 4. Weft infeed and transfer apparatus to any of claims 1 to 3, characterised in that the gripper system of the infeed rapier has components which are closed against one another by means of a spring, and a set screw located close to a boss or protuberance of the cover portion, by means of which a rocking action of the top cover is actuated, assumes a position of abutment against the body portion of the infeed rapier whereby the extent of opening of the cover portion relative to the body portion is restricted.

10 5. Weft infeed and transfer apparatus according to claim 1, characterised in that the movable element of the transfer rapier is a lever one of whose ends carries one component of a gripper system of the transfer rapier associated with a lug, which retains or holds back the weft thread, and co-operates with a ramp carried by a stationary hook forming said stationary element of the transfer rapier and the other component of the gripper system thereof.

20 6. Weft infeed and transfer apparatus

according to claim 1, characterised in that the movable element of the transfer rapier is constituted by a pivotable rod one of whose ends carries one component part of a gripper system of the transfer rapier whose orientation relative to the pivotable rod is realised in combination with another gripper component of the gripper system associated with a stationary hook which forms said stationary element of the transfer rapier.

7. Weft infeed and transfer apparatus according to any of claims 1 to 6, characterised in that a gripper component in each gripper system of the transfer and infeed rapiers is attached to the movable element and the rockable cover respectively of the two rapiers, the position of this gripper component relative to the said movable element and rockable cover being adjustable by means of screws and oblong holes.

8. Weft infeed and transfer apparatus substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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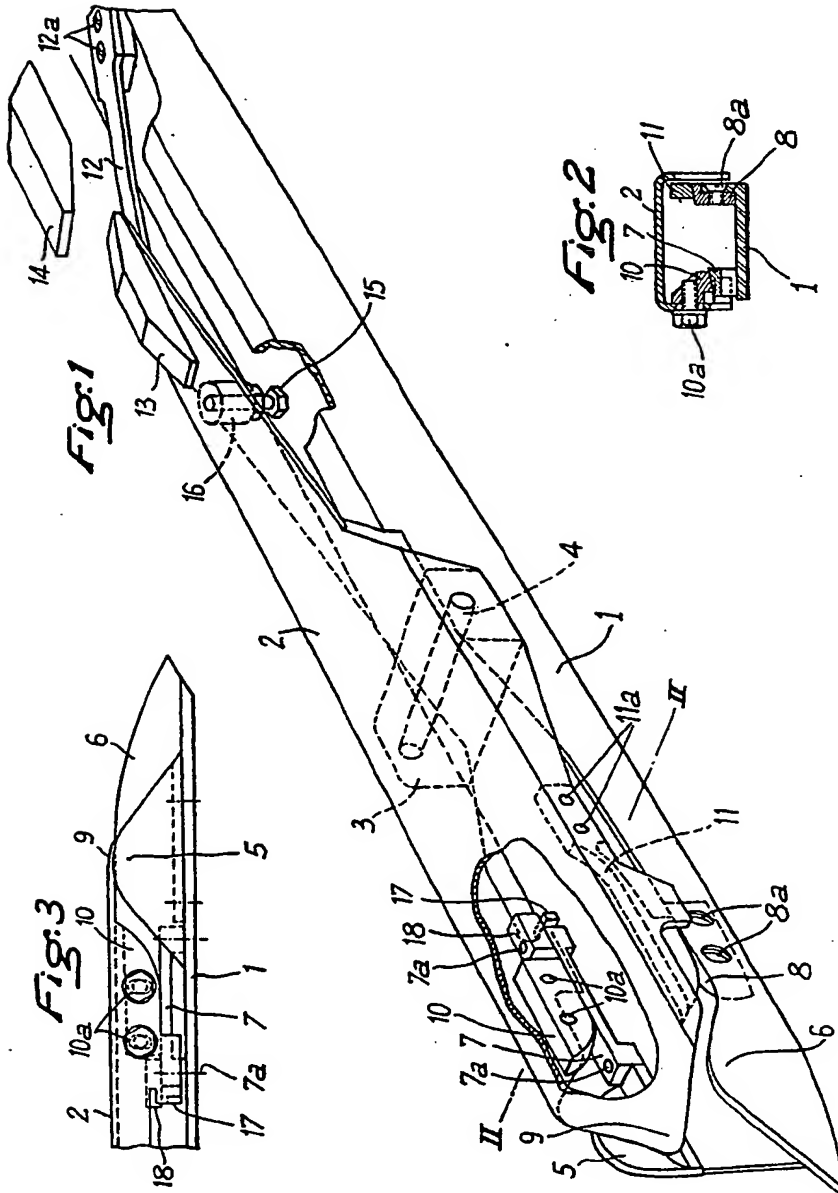
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COMPLETE SPECIFICATION

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Sheet 1



3 SHEETS

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COMPLETE SPECIFICATION

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